

REMARKS/ARGUMENTS

Applicant would like to thank the Examiner for the careful consideration given the present application. The application has been carefully reviewed in light of the Office action, and the following remarks are submitted for the Examiner's consideration.

Claims 1, 9, 14, 15, 17, 25, 30 and 31 of the present patent application has been rejected under 35 U.S.C. 102(b) as being anticipated by the newly cited reference, Dowling et al. (U.S. Patent No. 6,548,667). However, the cited Dowling et al. reference was published on April 15, 2003, and it was not published more than one year prior to the U.S. filing date of the present application, June 27, 2003. Therefore, the cited reference, Dowling et al., is improper as a prior art under Section 102(b).

Claims 2-8, 10-13, 18, 20, 21, 23, 24, 26, 28 and 29 of the present patent application has been rejected under 35 U.S.C. 103(a) for obviousness from Dowling et al. in view of Lys et al., U.S. Patent 6,459,919. The present application was filed claiming Convention Priority based on Japanese Patent application No. 2000-193202 duly filed on June 27, 2000. The Applicant respectfully asserts the benefit of Convention Priority based on the above-noted Japanese Patent application, which was duly filed in Japan earlier than the filing date of Dowling et al., September 19, 2000. An accurate English translation of the Japanese Patent application No. 2000-193202 is submitted in order to secure the priority under 35 U.S.C 119. Therefore, the cited reference Dowling et al., is improper as a prior art under 35 USC 103(a).

In light of the foregoing, it is respectfully submitted that the present application is in a condition for allowance and notice to that effect is hereby requested. If it is determined that the application is not in a condition for allowance, the Examiner is invited to initiate a telephone


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application is not in a condition for allowance, the Examiner is invited to initiate a telephone interview with the undersigned attorney to expedite prosecution of the present application.

If there are any additional fees resulting from this communication, please charge same to our Deposit Account No. 16-0820, our Order No. 33733.

Respectfully submitted,

PEARNE & GORDON LLP

By: 
Suzanne B. Gagnon, Reg. No. 48924

526 Superior Avenue, East
Suite 1200
Cleveland, Ohio 44114-1484
(216) 579-1700

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To: Commissioner of the Patent Office
[Inventor]
 [Domicile] c/o Matsushita Communication Industrial Co., Ltd.,
 3-1, Tsunashima-higashi 4-chome, Kohoku-ku, Yokohama-shi,
 Kanagawa-ken, Japan
 [Name] Kazuya SUZUKI
[Inventor]
 [Domicile] c/o Matsushita Communication Industrial Co., Ltd.,
 3-1, Tsunashima-higashi 4-chome, Kohoku-ku, Yokohama-shi,
 Kanagawa-ken, Japan
 [Name] Toshikazu SAITO
[Inventor]
 [Domicile] c/o Matsushita Communication Industrial Co., Ltd.,
 3-1, Tsunashima-higashi 4-chome, Kohoku-ku, Yokohama-shi,
 Kanagawa-ken, Japan
 [Name] Kazuya SAKURAI
[Applicant for Patent]
 [Identification Number] 000005821
 [Name] MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
[Agent]
 [Identification Number] 100072604
 [Patent Attorney]
 [Name] Gunichiro Ariga
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Applicant's Historical Information

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[Reason of Change] New Entry

Domicile 1006, Oaza Kadoma, Kadoma-shi, OSAKA

Name Matsushita Electric Industrial Co., Ltd.

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[Title of Invention] Appliance Maintenance Apparatus and Appliance Remote Maintenance System

[Scopes of the Claims]

5 [Claim 1]

An appliance maintenance apparatus for maintaining appliances including light indicators emitting lights showing the operation states of each of said appliances, and said appliance maintenance apparatus comprises light detecting means for detecting said lights emitted from said light indicators.

10 [Claim 2]

An appliance maintenance apparatus as set forth in claim 1, in which said light detecting means includes light receiving elements to be respectively positioned in face-to-face and spaced relationship with said light indicators of each of said appliances.

15 [Claim 3]

An appliance maintenance apparatus as set forth in claim 1 or 2, in which said appliances have a reset switch for resetting the operations of said appliances, and said appliance maintenance apparatus comprises judging means for judging whether or not to operate said reset switch after diagnosing said operation states of said appliances based on said light information detected by said light detecting means and reset switch operating means for pushing down said reset switch when said judging means judges to operate said reset switch.

[Claim 4]

25 An appliance maintenance apparatus as set forth in claim 2 or 3, in which each of said appliances are constituted by a base plates having one side surface on which said light indicators are aligned, and further comprises a housing having an opening in which said base plates are arranged so that said light indicators on said base plate are aliened within said opening; and a front cover plate having an inner surface and positioned to cover said opening of said housing with said inner surface facing said opening of said housing, wherein said light receiving elements are provided on one side surface of said front cover in face-to-face and spaced relationship with said light indicators.

[Claim 5]

35 An appliance maintenance apparatus as set forth in claim 4, in which said reset switch is provided on said one side surface of said base plate, and said reset switch operating means is provided on said inner surface of said front cover plate in face-to-face and spaced relationship with said reset switch.

[Claim 6]

40 An appliance maintenance apparatus as set forth in any one of claims 1 to 5, which further comprises light indicators showing light information detected by said

light detecting means.

[Claim 7]

An appliance maintenance apparatus as set forth in any one of claims 1 to 6, which further comprises light information recording means for storage of light
5 information detected by said light detecting means.

[Claim 8]

An appliance maintenance apparatus as set forth in any one of claims 1 to 7, which further comprises communication means for communicating with said remote
10 diagnosis control unit for remotely diagnosing said appliances thorough public network.

[Claim 9]

An appliance remote maintenance system for maintaining a plurality of appliances at distant remotely, each of said appliances including a plurality of light indicators respectively emitting lights showing the operation states of each of said
15 appliances, comprising an appliance maintenance apparatus including light detecting means for detecting said lights emitted from said light indicators, said lights collectively form light information, and information transmitting means for transmitting said light information detected by said light detecting means through a public network, and a remote diagnosis control apparatus including information
20 receiving means for receiving said information transmitted from said information transmitting means through said public network to ensure the remote diagnosis controls of said appliances.

[Claim 10]

An appliance remote maintenance system as set forth in claim 9, in which said
25 light detecting means of said appliance maintenance apparatus includes a plurality of light receiving elements to be respectively positioned in face-to-face and spaced relationship with said light indicators of each of said appliances.

[Claim 11]

An appliance remote maintenance system as set forth in claim 9 or 10, in
30 which each of said appliances has a reset switch for resetting the operation of said appliances, said remote diagnosis control apparatus further comprises judging means for judging whether or not to operate said reset switch after diagnosing said operation states of said appliance based on said light information detected by said light detecting means, and instruction transmitting means for transmitting through said public network
35 to said appliance maintenance apparatus an instruction to operate said reset switch when said judging means judges to operate said reset switch, and said appliance maintenance apparatus further comprises instruction receiving means for receiving said instruction transmitted from said instruction transmitting means through said public network and reset switch operating means for operating said reset switch in compliance
40 with said instruction transmitted from said instruction transmitting means and received by said instruction receiving means.

[Claim 12]

An appliance remote maintenance system as set forth in claim 10 or 11, in which each of said appliances is constituted by a base plate having one side surface on which said light indicators are provided, and said appliance comprises a housing
5 having an opening and accommodating a plurality of said base plates therein where said light indicators are aligned on said one side surface of said base plate at said opening, and a front cover having an inner surface and positioned to cover said opening of said housing with said inner surface, where a plurality of said light receiving elements is arranged thereon in face-to-face and spaced relationship with
10 said light indicators in opposite position of said opening.

[Claim 13]

An appliance remote maintenance system as set forth in claim 12, in which said reset switch is provided on said one side surface of said base plate, and said reset switch operating means is provided on said inner surface of said front cover plate in
15 face-to-face and spaced relationship with said reset switch.

[Claim 14]

An appliance remote maintenance system as set forth in any one of claims 9 to 13, which further comprises light information indicating means for indicating light information detected by said light detecting means of said appliance maintenance
20 apparatus.

[Claim 15]

An appliance remote maintenance system as set forth in claims 9 to 14, which further comprises light information recording means for storage of light information detected by said light detecting means of said appliance maintenance apparatus.

[Detailed Description of the Invention]

[0001]

[Technology Field belonging to the Invention]

The present invention relates to an appliance maintenance apparatus and an appliance remote maintenance system, more particularly, relates to an appliance
30 maintenance apparatus which is able to detect the operation states of the appliances without direct contact and is able to operate the appliances in response to its operation states and an appliance remote maintenance system including an appliance maintenance apparatus and a remote diagnosis control apparatus which communicates with the appliance maintenance apparatus through a public network to ensure the
35 remote diagnosis control of the apparatus from a remote place.

[Prior Art Technology]

[0002]

Many surveillance camera systems are arranged in a counter, a cashier, an elevator, a parking lot or the like at which many people gather such as department
40 stores, leisure centers, a business establishment or places where high-priced goods or a

large amounts of money are handled. The surveillance camera system of this kind generally comprises a plurality of camera units for taking images in these places and a display unit for displaying the images taken by the camera units. The display unit is in general located far away from the camera units and an operator is able to monitor the situation of these places by the display unit located in the surveillance center or an exterior monitoring center where is distant from the camera units.

[0003]

In such a surveillance camera system, if a plurality of display units to take images (photographical pictures) is smaller in number than the camera units, many surveillance camera units are alternatively connected to the monitor unit by the connection switching means called matrix switcher. Moreover, in such a surveillance camera system, a recording appliance for recording images taken by camera units is provided, and it is also connected with a matrix switcher. Thus, the recording appliance is also alternatively connected with a surveillance camera unit.

[0004]

As shown in FIG. 5, the conventional matrix switcher 1 comprises two or more base plates 3 having input and output terminals respectively connected with the camera units, the display unit and other appliances. Usually, The base plates 3 has one side surface 3a on which are provided a plurality of LED light indicators 5 for diagnosis showing the operation states of the base plate 3, and the other side surface 3b having input and output terminals, not shown in the drawing, thereon. A housing 7 having an opening 7a and accommodating therein the base plates 3 is equipped so that the LED light indicators 5 on the surface 3a aligned with one another at the opening 7a. Furthermore, the opening 7a of the housing 7 is covered by a front cover 11.

[0005]

Moreover, as shown in FIG. 6, the conventional matrix switcher 1 is controlled and supervised by a remote diagnosis control apparatus 15 which is installed far away from the matrix switcher 1, which is communicated with the matrix switcher 1 through a public network 13 to check the operation states of the matrix switcher 1.

[0006]

[Problems to be Solved by the Invention]

Such a conventional surveillance camera system, however, has problems that the LED light indicators 5 cannot be watched from outside the housing 7 because the front cover 11 lies, thereby forcing an operator to remove the front cover 11 from the housing 7 to confirm the contents of the LED light indicators 5 at maintenances.

[0007]

Furthermore, the conventional surveillance camera system is usually provided with a remote diagnosis function to diagnose the camera units from the remote place through the network. It, however, cannot function to control the camera units through the public network 13 when a controller forming part of the surveillance camera

system comes to be out of order. If the operator wishes to maintain the controller, the operator is required to confirm the contents of the LED light indicators at first and to communicate by telephone with persons in charge of the system maintenance to begin restoration procedure. The operator's task for this procedure is liable to be laborious and needs much time to be consumed.

[0008]

The present invention is provided in order to solve these problems, and it provides an appliance maintenance apparatus which can detect the operation states of appliances without contact and further can operate the appliances in response to the operation states of the appliances, and provides an appliance remote maintenance system which comprises an appliance maintenance apparatus and a remote diagnosis control apparatus which can communicate with the appliance maintenance apparatus through a public network to ensure the remote diagnosis control of the appliance maintenance apparatus from a remote place.

[0009]

Furthermore, present invention provides an appliance maintenance apparatus and an appliance remote maintenance system which does not need operator on the spot to be dispatched to the site where the appliances out of order are installed but can specify the appliances out of order and separate the damaged appliances from the system, thereby enabling the operator to report the failure of the appliances to users as well as making it possible to reduce remarkably the cost for the maintenances of these appliances.

[0010]

[METHODS TO SOLVE THE PROBLEMS]

The appliance maintenance apparatus of the present invention is an apparatus used for maintaining appliances including light indicators emitting lights showing the operation states of each of the appliances, and the apparatus comprise light detecting means for detecting the lights emitted from the light indicators.

[0011]

Owing to the above-mentioned constitution, the operating state of the appliances can be detected without any contact with them. That is, this appliance maintenance apparatus can detect the operating state of an apparatus, without being influenced by the state of an apparatus, since an apparatus has a constitution completely independent from the appliances.

[0012]

Here, the light detecting means of the aforementioned appliance maintenance apparatus preferably includes light receiving elements to be respectively positioned in face-to-face and spaced relationship with the light indicators of each of the appliances.

[0013]

Moreover, the appliance maintenance apparatus of this invention, which has light indicators emitting lights showing the operation states of the appliances and a reset switch for resetting the operations of the appliances, may further comprise light detecting means for detecting the lights emitted from the light indicators, judging means for judging whether or not to operate the reset switch after diagnosing the operation states of the appliances based on the light information detected by the light detecting means and reset switch operating means for pushing down the reset switch when the judging means judges to operate the reset switch.

[0014]

Under such constituent, the operating state of an apparatus can be diagnosed based on the optical information detected without contact, and the pressing down of the reset switch can be carried out based on this diagnostic result.

[0015]

Furthermore, the appliance maintenance apparatus of this invention in which the appliance is constituted by a base plates having one side surface on which the light indicators are aligned, and further may comprise a housing having an opening in which the base plates are arranged so that the light indicators on the base plate are aligned within the opening, and a front cover plate having an inner surface is positioned to cover over the opening of the housing with the inner surface opposing the opening of the housing, wherein the light receiving elements are provided on one side surface of the front cover in face-to-face and spaced relationship with the light indicators.

[0016]

Thus, the appliance maintenance apparatus detectable without contact can be constituted by only exchanging the conventional front cover with the front cover of the appliance maintenance apparatus of this invention covering over the opening of housing which holds the comprising a plurality of base plates. Furthermore, the operating state of the appliances can be supervised without removing the front cover.

[0017]

The appliance maintenance apparatus of this invention may further comprises a common reset switch which is provided on the one side surface of the base plate and the reset switch operating means is provided on the inner surface of the front cover plate in face-to-face and spaced relationship with the reset switch.

[0018]

The above appliance maintenance apparatus can be constituted as operational for the reset action switch of the appliance only by exchanging the conventional front cover with the front cover of the appliance maintenance apparatus of this invention for wrapping opening of housing which holds the appliance having two or more base plates. Furthermore, the reset action switch of the appliance can be operated without removing a front cover.

[0019]

The appliance maintenance apparatus of this invention also may comprise light indicator showing light information detected by the light detecting means. Because of this constituent, the display state of the appliance can be watched visually and the operating state of an apparatus can be supervised without contact.

5 [0020]

The appliance maintenance apparatus of this invention may further comprises light information recording means for storage of light information detected by the light detecting means. Since the operating state information on the appliances can be accumulated, this embodiment enables it to obtain change by time progress in the operating state of the appliance.

10 [0021]

The appliance maintenance apparatus of this invention may be further equipped with communication means for communicating with the remote diagnosis control unit for remotely diagnosing the appliances thorough public network. By this arrangement, the remote diagnostic control unit of a remote place can detect operating state to the appliance without contact.

15 [0022]

The appliance remote maintenance system of this invention, which is the system for maintaining a plurality of appliances from a remote location and each of appliances include light indicators respectively emitting lights showing the operation states of each appliances, may comprises an appliance maintenance apparatus including light detecting means for detecting the lights emitted from the light indicators, the lights collectively form light information, and information transmitting means for transmitting the light information detected by the light detecting means through a public network, and a remote diagnosis control apparatus including information receiving means for receiving the information transmitted from the information transmitting means through the public network to ensure the remote diagnosis controls of the appliances.

20 [0023]

It becomes possible to provide with information on operation states of appliances to the appliance maintenance apparatus and the remote diagnostic control apparatus in a remote place, being able to arrange appliances, appliance maintenance apparatus, and a remote diagnostic control unit as the independent components, respectively, and not being influenced by the state of the appliances, since the operating state of a appliances can be detected without contact and the information is transmitted to the remote diagnostic control unit of a remote place trough a public network.

25 [0024]

Here, the light detecting means of the appliance remote maintenance apparatus include a plurality of light receiving elements to be respectively positioned in face-to-face and spaced relationship with the light indicators of each of the

appliances.

[0025]

Moreover, the apparatus remote maintenance system of this invention, which includes each of the appliances has a light indicator for showing its operation state and reset switch for resetting the operation of the appliances, may comprises an appliance
5 maintenance apparatus including light detecting means for detecting the lights emitted from the light indicators, information transmitting means for transmitting the light information detected by the light detecting means through a public network, and a remote diagnosis control apparatus including information receiving means for
10 receiving the information transmitted from the information transmitting means through a public network to ensure the remote diagnosis controls of the appliances, judging means for judging whether to operate the reset switch after diagnosing the operation states of appliances based on the light information detected by the light detecting
15 means, and instruction transmitting means for transmitting through the public network to the appliance maintenance apparatus an instruction to operate the reset switch when the judging means judges to operate the reset switch, and further the appliance maintenance apparatus comprises instruction receiving means for receiving the instruction transmitted from the instruction transmitting means through the public
20 network and reset switch operating means for operating the reset switch in compliance with instructions transmitted from the instruction transmitting means and received by the instruction receiving means.

[0026]

According to this constituents, the operating state of a appliance can be diagnosed in a remote place based on the light information of the apparatus detected
25 under non-contact, and the directions which carry out the pushing down of the reset switch of a appliance from the remote diagnostic control unit in a remote place can be carried out based on this diagnostic result.

[0027]

Moreover, the apparatus remote maintenance system of this invention has
30 reset switch which is provided on one side surface of the base plate, and the reset switch operating means is arranged on inner surface of the front cover plate in face-to-face and spaced relationship with the reset switch.

[0028]

Thus, an appliance maintenance apparatus detectable as to the operating state
35 of a appliance without contact can be constituted only by exchanging the conventional front cover with the front cover of the appliance maintenance apparatus of this invention for opening of the housing in which the appliances having a plurality of base plates. Furthermore, the operating state of an apparatus can be supervised from a remote place, without removing a front cover.

40 [0029]

Moreover, in the apparatus remote maintenance system of this invention, the

reset action switch may be equipped on one surface side of the base plate and the operation means of the appliance maintenance apparatus may be equipped at position of face-to-faced and isolated to the reset switch of the appliances and on one surface of the front cover.

5 [0030]

At the appliance maintenance apparatus remote maintenance system thus constructed, the reset action switch of the appliances can operative by exchanging a conventional front cover to the front cover of the appliance maintenance apparatus of this invention for opening of housing in which holds the appliances comprising two or more base plate. Furthermore, the reset switch of the appliances can be operated from a remote place, without removing a front cover.

[0031]

15 An appliance remote maintenance system may further comprises light information indicating means for indicating light information detected by the light detecting means of the appliance maintenance apparatus. By this constituent, the operation state of appliances can be checked visually and the operating state of the appliances can be supervised without contact. Here, the indicating means may be a display unit connected to appliance maintenance apparatus, and may be the same connected to the remote diagnostic control unit of a remote place.

20 [0032]

Moreover, the apparatus remote maintenance system of this invention may comprise light information recording means for storage of light information detected by the light detecting means of the appliance maintenance apparatus. This constituent enables it to obtain change by time progress of the operating state of an appliances, for the operating state of an apparatus can be accumulated,

25 [0033]

[Embodiment of the Invention]

Hereafter, the embodiments of this invention are explained refereeing drawings. In all drawings, the same constituent feature is shown by the same reference numerals and the same sign.

30 [0034]

The appliance maintenance apparatus of this invention maintains the apparatus is used for LED light indicator which emits the light which shows operating state of appliances.

35 [0035]

FIG. 1 (a) shows the front view of the matrix switcher 1, in here, which is an objective devise to detect the operating state of the appliance maintenance apparatus as an embodiment of this invention. FIG. 1 (b) shows the front view of the appliance maintenance apparatus as the embodiment of this invention. FIG. 1 (c) shows the rear view of the appliance maintenance apparatus of FIG. 1 (b). Since the matrix switcher

40

1 is the similar the conventional matrix switcher of FIG. 5 as shown in FIG. 1 (a), detailed explanation on it is omitted.

[0036]

As shown in FIG. 1 (b) and (c), the appliance maintenance apparatus of the embodiment is constituted as a front cover 21 to cover over the opening 7a of the housing 7 of the matrix switcher 1. It is attached to the housing 7 of the matrix switcher 1 by a fastener, not illustrated. In this embodiment, the front cover 21 has an inner surface, i.e., a front surface 21a, and a rear surface 21b to be disposed in face-to-face and spaced relationship with the opening 7a of the housing 7. The rear surface 21b of the front cover 21 is provided with light receiving elements 25a and 25b respectively arranged in face-to-face and space relationship with the LED light indicators 5 mounted on the appliance 3 to detect the light emitted from the indicator 5.

[0037]

For example, the light receiving elements 25 a and 25b prepared on rear surface 21b of the front cover 21 and the LED indicators 5a and 5b of an appliance 3 are provided to the position in face-to-face and spaced relationship with each other. In this embodiment, the light receiving elements 25 is previously aligned so as to correspond with arrangement of the LED indicator 5. In another embodiment, light receiving elements may be arranged in the shape of grid at the predetermined intervals. In this embodiment, the respective position of each light receiving element is given in coordinates to prepare a table showing the position in the coordinates of the LED indicator to be detected, and the positions of the detectors and the indicators are related with each other.

[0038]

Furthermore, the appliance maintenance apparatus of an embodiment of this invention further comprises reset switch operating means 29 mounted on the rear surface of front cover 21 to push down the reset switch 9 of the matrix switcher 1. The reset switch operating means 29 is constituted by a plunger and the like. The plunger 29 is arranged at a position of face-to-face and spaced relationship with the reset switch 9 of the matrix switcher 1 so that the reset switch 9 of matrix switcher 1 is pushed down by the plunger 29. The plunger 29 is surrounded by a solenoid coil when the plunger 129 is electrically operated with the solenoid coil energized to move toward with the reset switch 9.

[0039]

FIG. 2 shows a block diagram of the appliance maintenance apparatus as shown in FIG. 1. The front cover 21 forming part of the appliance maintenance apparatus is provided with a central processing unit, CPU 31 for controlling the whole parts of the appliance maintenance apparatus, a light receiving unit 33 for receiving lights detected at the light receiving elements 5, a switch operation unit 35 for

operating the plunger 29 and a communication unit 37 for controlling communication between the appliance maintenance apparatus and other outside apparatuses located away from the appliance maintenance apparatus. This embodiment of appliance maintenance apparatus according to the present invention comprises a front cover 21 and a diagnostic apparatus 41 electrically connected to the front cover 21 through a communication cable 39.

[0040]

The light receiving unit 33 is electrically connected to the CPU 31 to receive the lights detected by the light receiving elements 5 and then output to the CPU 31 the light information that light was detected.

[0041]

The switch operation unit 35 is electrically connected to the CPU 31 to operate the plunger 29 of FIG. 1, in response to the instruction from the CPU 31 and then to push down the reset operation switch 9.

[0042]

The communication unit 37 is, for instance, designed to transmit the light information detected by the light receiving unit 33 to the diagnostic apparatus 41 and to receive the instruction to operate the reset operation switch of the appliance from the diagnostic apparatus 41.

[0043]

The communication cable 39 is made of a serial telecommunication cable. In this embodiment, the front cover 21 and diagnostic apparatus 41 of appliance maintenance apparatus are explained as the case of using communication cable 39. Alternatively, the communication between the appliance maintenance apparatus and the diagnostic unit 44 may be carried out wirelessly, in place of the communication cable 39.

[0044]

The diagnostic apparatus 41 is adapted to receive the light of LED light indicator 5 of the appliance 3 to be detected through the communication cable 39. It diagnoses the operation states of the appliances and judges whether to operate the reset switch 9 or not. Furthermore, the diagnostic apparatus 41 is adapted to send an instruction to the switch operating means 29 to operate the reset switch 9 when it is judged that the reset switch 9 is to be operated.

[0045]

The appliance maintenance apparatus constructed as the above can diagnose the operation states of the appliances 3 without any influence from those appliances 3, since the appliance maintenance apparatus 21 can be constituted independently from

the appliances 3 to be detected. Moreover, based on the optical information on the LED light indicator 5 of the appliance 3, the operating state of an appliance 3 can be diagnosed and the effect that the depression of the reset action switch 9 of an appliance 3 can be carried out is acquired depending on the diagnostic result.

5 [0046]

As shown in FIG. 1, the appliance maintenance apparatus of this invention can constitute an apparatus detectable without contact the operation state of the appliances only by exchanging the front cover 11 of the conventional apparatus, for example, a matrix switcher 1, with the front cover 21 of the appliance maintenance apparatus of this invention. As to a conventional apparatus, an operator had to remove front cover 11 to watch directly the operation state of the LED light indicator 5 by his or her naked eyes and, however, the appliance maintenance apparatus of this invention can detect the operating state of the appliance without removing a front cover 21 and further the reset switch of a appliance 3 can be operated depending upon the diagnostic result.

15 [0047]

In the other embodiment, the diagnostic apparatus 41 may have the indicating unit (not illustrated) which displays the light information on the light detected by the light receiving unit 33. Thereby, the display state of the LED light indicator 5 of an appliance s can be checked visually, and the operating state of an apparatus can be supervised without contact.

20 [0048]

In another embodiment, the diagnostic apparatus 41 may have a storage means (not illustrated) to storage and accumulate the information on the light detected by the light receiving unit 33. Thereby, it becomes possible to obtain change by time progress of the operating state of an apparatus, for the operating state information on an apparatus can be accumulated,

25 [0049]

Furthermore, the diagnostic apparatus 41 may be provided with various types of functions. Alternatively, the diagnostic apparatus may be only designed to keep logs of the light information of the LED light indicator 5 of the appliance and to output it in the form of a screen display, a document output or data output.

30 [0050]

Although the embodiment in which the appliance maintenance apparatus constituted by the front cover have been described above, the appliance maintenance apparatus of this invention may have a structure in which the light detecting units are mounted on the appliance other than a front cover so that the light of the LED light indicator 5 can be detected, and the reset switch operating means are arranged so that the pressing down of the reset switch 9 can be carried out.

35 [0051]

FIG. 3 shows the block diagram of the appliance remote maintenance system as the second aspect of present invention. Referring to the drawing, the appliance remote maintenance system comprises a plurality of appliance maintenance apparatuses 21, at least one diagnostic apparatus 41, a personal computer 51 for remote maintenance and a public line network 53 for connecting the diagnostic apparatuses 41 and the remote maintenance personal computer 51.

[0052]

The second aspect is differ form the first aspect of this invention in that it includes at least one diagnostic apparatus 41 which diagnoses the operation state of a plurality of appliances based on the light information from a plurality of appliance maintenance apparatuses 21 and the personal computer 51 for remote maintenance connected with diagnostic apparatus 41 through the public line network 53.

[0053]

FIG. 4 shows a detailed block diagram illustrating the diagnostic apparatus 41 of the appliance remote maintenance system according to the present invention. As seen from the drawing, the diagnostic apparatus 41 comprises a CPU 43 for controlling the whole parts of the diagnostic apparatus, a memory 45 for storing a various types of information, a communication unit 47 for controlling communication between the diagnostic apparatus 41 and the appliance maintenance apparatuses 21 through the communication cable 39, and an interface unit 49 for controlling communication between the diagnostic apparatus and other outside apparatuses connected through the public line network 53.

[0054]

The memory 45 is adapted to store information such as light information about the operation states of the appliances transmitted by the appliance maintenance apparatuses. The memory 45 enables to keep logs of the light information and the operation states of the appliances with respect to the elapsed time, thereby permitting the diagnostic apparatus 41 to record the change of the operation states of the appliances with respect to the elapsed time.

[0055]

The public line network 153 includes, for instance, a digital or analog communication line. An operator, for example, may dial up to connect with the diagnostic apparatus 41 from the personal computer 51 for remote maintenance to retrieve the light information and operation states of the appliances stored in the memory 45 of the diagnostic apparatus 41. The public line network 53 enables the communications between personal computer 51 for the remote maintenance and the diagnostic apparatuses 41 located at any place in all over the world.

[0056]

The personal computer 51 for remote maintenance may be a commercially available personal computer or a work station. For example, it comprises a CPU for controlling under a certain OS the whole parts of the remote maintenance personal computer 51, a storage section such as a magnetic disk storage for storing programs and data files, a memory for providing a working area of the CPU, a monitor for displaying various types of information screens, input means such as a key board and a mouse, a printer for printing out data information, a speaker for outputting voice information, and a line interface connectable with the public line network 53.

[0057]

The personal computer 51 for remote maintenance is adapted to receive the light information of LED light indicator 5 and operation states of the appliances from the diagnostic apparatus 41 through the public line network 53, to store the thus received light information and operation states of the appliances into the recording unit, to perform the programs such as a diagnostic program, analyze information obtained, and output the result by displaying, printing or sounding a voice alarm. The past log information also can be outputted by the personal computer 51 output, if displaying or printing out is adapted.

[0058]

The diagnostic program may be prepared so that a reset instruction to the diagnostic apparatus 41 is sent automatically in order to reset the appliances based on the diagnosis, or so that a reset instruction is sent to the diagnostic apparatus 41 in compliance with the operator's decision after confirming the operation states of the appliances by watching the display screen, a document output or the like.

[0059]

The operation of the embodiment of the appliance remote maintenance system according to the present invention will be described hereinafter.

[0060]

The appliances to be detected and maintained are connected with the front cover 21 of the appliance maintenance apparatus of the present invention and the state is shown by lights emitted collectively from the LED light indicators 5.

[0061]

The lights emitted from the LED light indicators 5 form light information. The light receiving elements 25 of the front cover 21 is operated to detect the light information emitted from the LED light indicators 5 and send the light information to the CPU 31 through the light receiving unit 33. The CPU 31 is operated to send the light information emitted from the LED light indicators 5 to diagnostic apparatus 41

through the communication unit 37 and the communication cable 139.

[0062]

The diagnostic apparatus 41 is operated to receive the light information from the communication unit 37 and store the received light information into the memory 45 through the CPU 143. The light information stored in the memory 45 of the diagnostic apparatus 41 will be transmitted to the remote maintenance personal computer 51 through the public line network 53 and the line interface.

[0063]

The light information stored in the memory 45 may be transmitted to the personal computer 51 for remote maintenance on demand or at a predetermined time interval. Alternatively, the personal computer 51 may directly received the light information emitted from the light LED light indicators 5 in responding to a demand via the diagnostic apparatus 41 from the personal computer 51.

[0064]

In the personal computer 51 for remote maintenance, the light information thus received is stored in the storage unit, not shown in drawings, and analyzed in accordance with analyzing software, and a result of the analysis is generated. The personal computer 51 is operated to output the analysis result, for instance, by a lamp indicator, a monitor display, not shown in drawings. The remote maintenance personal compute 51 may print out the analysis result into papers or output voice information. The operator can maintain the appliances in response to the analysis result thus outputted, and give a reset instruction if necessary. The reset instruction is transmitted to the diagnostic apparatus 41 from the personal computer 51 through the public line network 53. The diagnostic apparatus 41 is operated to receive the reset instruction and transmit the reset instruction thus received to the concerned appliance maintenance apparatus. The appliance maintenance apparatus is operated to actuate the plunger 29 to push down the reset switch 9. The appliance remote maintenance system thus constructed enables the operator to reset the concerned appliances and restore the fault appliances without visiting to the site where the appliances are installed.

[0065]

The reset instruction may be transmitted at predetermined time interval according to a certain program. The diagnostic apparatus 41 may include a diagnostic program for automatically diagnosing and resetting the appliances.

[0066]

In the appliance remote maintenance system thus constructed, the appliance

maintenance apparatus can detect without contact the operation states of the appliances and transmit the information about the operation states of the appliances to the personal computer 51 for remote maintenance where is far from the appliance maintenance apparatus 21 through the public line network 53. The appliances 3, the
5 appliance maintenance apparatus 21 and the personal computer 51 can be located separately, thereby enabling for the appliance maintenance apparatus to transmit the operation states of the appliances to the personal computer 51 without receiving any influence from those appliances. In addition, the appliance remote maintenance system thus constructed makes it possible for the operator to remotely diagnose the
10 operation states of the appliances based on the optical information on the LED light indicator 5 of the appliances 3 detected without contact and instruct to push down the reset switch 9 of the appliances 3 by operating the personal computer 51 in remote place, responding to the diagnostic result.

[0067]

15 The appliance remote maintenance system thus constructed can detect, without contact, the operation states of the appliances 3 and operate the reset switch at remote place only by replacing the front cover 11 of the conventional matrix switcher 1 with the front cover 21 of the appliance maintenance apparatus and without removing the front cover 21 of the appliance maintenance apparatus.

20 [0068]

According to the apparatus remote maintenance system of this invention, even if a front cover is not removed, the operating state of an appliance can be outputted as alarm and the log of the operating state thereof can be checked by the display screen of a personal computer from a remote place. Further, even if a maintenance people does
25 not visit to the place in which the detecting appliance is installed, it is possible that remote maintenance, such as a diagnosis of a fault, reboot by the pushing down of the reset switch of a failure apparatus and secession from the system can be performed. Thus, it become not necessary that maintenance people goes down to the location of a appliance or they have to be anytime at the maintenance location, but the system can
30 be restored soon and a report of a maintenance result to a user can be made quickly. It is also possible to reduce remarkably cost for maintenance.

[0069]

[Effect of the Invention]

35 As will be seen from the foregoing description, the appliance maintenance apparatus according to the present invention makes it possible for the operator to observe the operation states without contact, since the apparatus has light detecting means for detecting the lights emitted from the light indicators, judging means for judging whether to operate the reset switch after diagnosing the operation states of the appliances on the basis of the light information detected by the light detecting means,

and reset switch operating means for operating the reset switch when the judging means judges to operate the reset switch. Further, the appliance maintenance apparatus makes it possible to detect and diagnose the appliance without any influence from state of the appliance, since the appliance maintenance apparatus has a constituent independent from appliances and to reset by pushing reset switch depend on the diagnostic result.

[0070]

Moreover, the appliance remote maintenance system according to the present invention makes it possible to make operator to observe the operation states of the appliances by watching the display of the personal computer from a place far from the appliance without influence from state of the appliance, and to instruct pushing down the reset switch by remote diagnostic apparatus. Since the system of this invention comprises the appliance maintenance apparatus including plurality of light indicators respectively emitting lights showing the operation states of each of the appliances, light detecting means for detecting the lights emitted from the light indicators, the lights collectively form light information, and information transmitting means for transmitting the light information detected by the light detecting means through a public network, judging means for judging whether to operate the reset switch after diagnosing the operation states of the appliance on the basis of the light information detected by the light detecting means and reset switch operating means for operating the reset switch in compliance with the instruction transmitted from the instruction transmitting means and received by the instruction receiving means and the remote diagnosis control apparatus connected with the above appliance maintenance apparatus through the public network.

[0071]

According to this invention, a maintenance service person does not need to take an visit to the site, but they can identify the locating fault, separate it from a system, and report to a user. As results, the present invention can offer the appliance maintenance apparatus and the apparatus remote maintenance system, which can save cost for maintaining the appliances.

[BRIEF DESCRIPTION OF THE DRAWINGS]

[FIG. 1]

(a) is a front view of a switcher connected with target appliances to be maintained; (b) is a front view of a front cover forming part of a first preferred embodiment of the appliance maintenance apparatus according to the present invention; (c) is a rear view of the front cover forming part of the first preferred embodiment of the appliance maintenance apparatus according to the present invention;

[FIG. 2]

It is an outline block diagram of the appliance maintenance apparatus according to the present invention shown in FIG. 1.

[FIG. 3]

5 It is a block diagram of the appliance remote maintenance system as the second preferred embodiment of the present invention.

[FIG. 4]

It is an outline block diagram of a remote diagnosis control apparatus forming part of the appliance remote maintenance system shown in FIG. 3.

10 [FIG. 5]

It is a perspective view of a conventional matrix switcher and a front cover forming part of the matrix switcher.

[FIG. 6]

It is an outline block diagram of the conventional matrix switcher.

15 [DESCRIPTION OF THE REFERENCE NUMERALS]

1 Matrix Switcher

3 Base Plate

3a One Side Surface

3b The Other Side Surface

20 5 LED light Indicator (Indicator)

7 Housing

9 Reset Switch

21 Front Cover (Appliance Maintenance Apparatus)

25, 25a, 25b Light Receiving Element

25 29 Plunger (Operation Means)

31 CPU (Means for Communications)

33 Light Receiving Unit (Light Detector, Light Receiving Element)

35 Switch Operation Unit (Means for operation)

37 Communications Unit (Means for Communications)

30 39 communication Cable (Means for Communications)

41 Diagnostic Apparatus (Judgment Means, Display Means)

43 CPU (Instruction Transmitting Means, Instruction Receiving Means)

45 Memory Unit (Storage Means)

47 Communication Unit (Instruction Transmitting Means, Instruction Receiving Means)

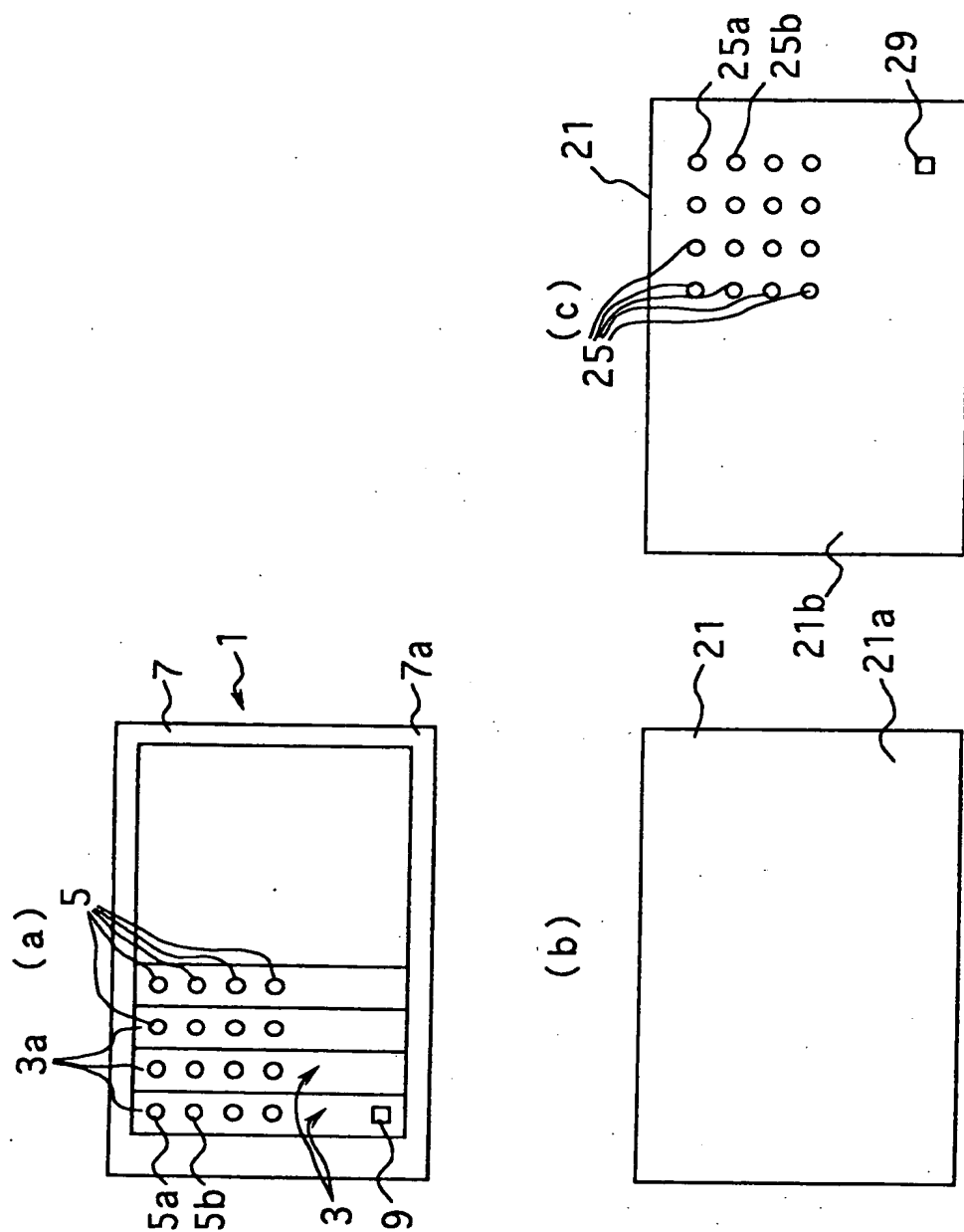
49 Interface unit for Line (Instruction Transmitting Means, Instruction Receiving Means)

51 Personal Computer for Remote Maintenance (Remote Diagnostic Control Unit, Judgment Means, Instruction Transmitting Means, Display Means)

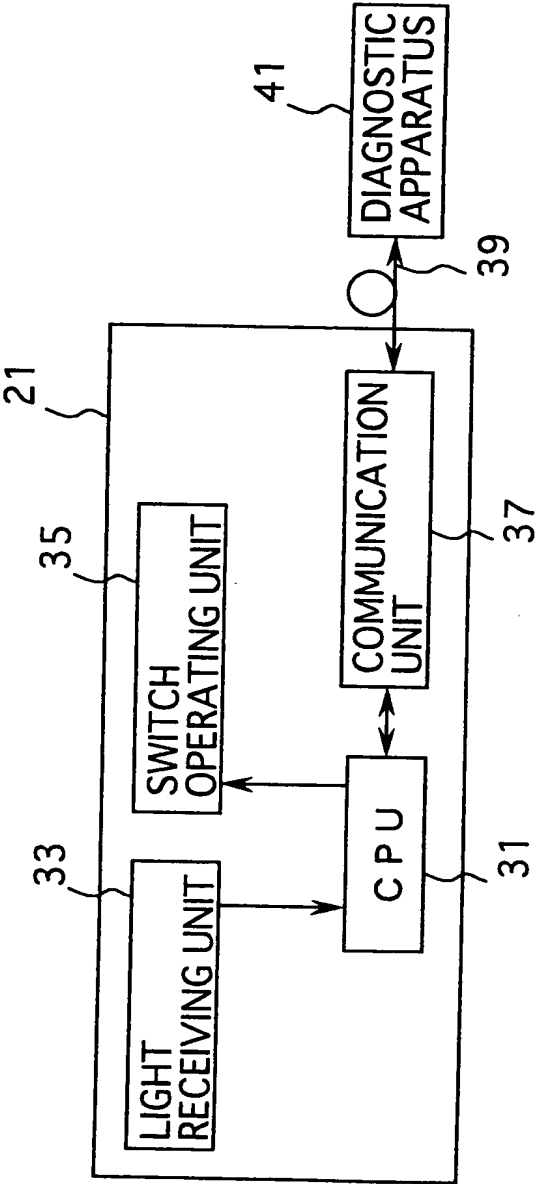
40 53 Public Line Network

【Title of the Document】 DRAWINGS

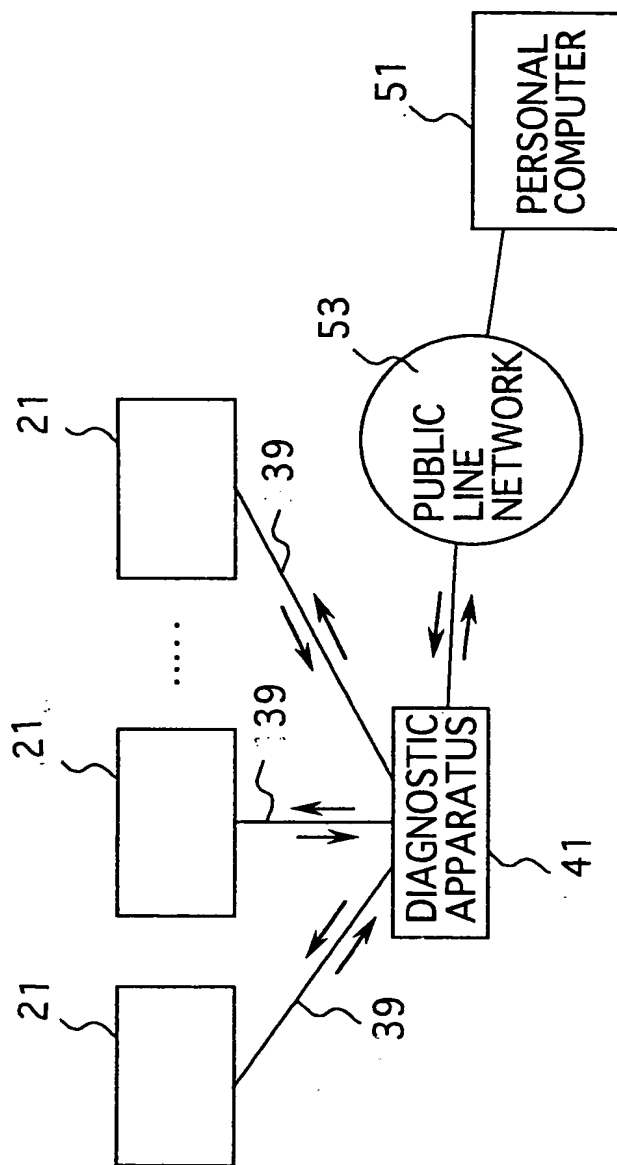
【FIG. 1】



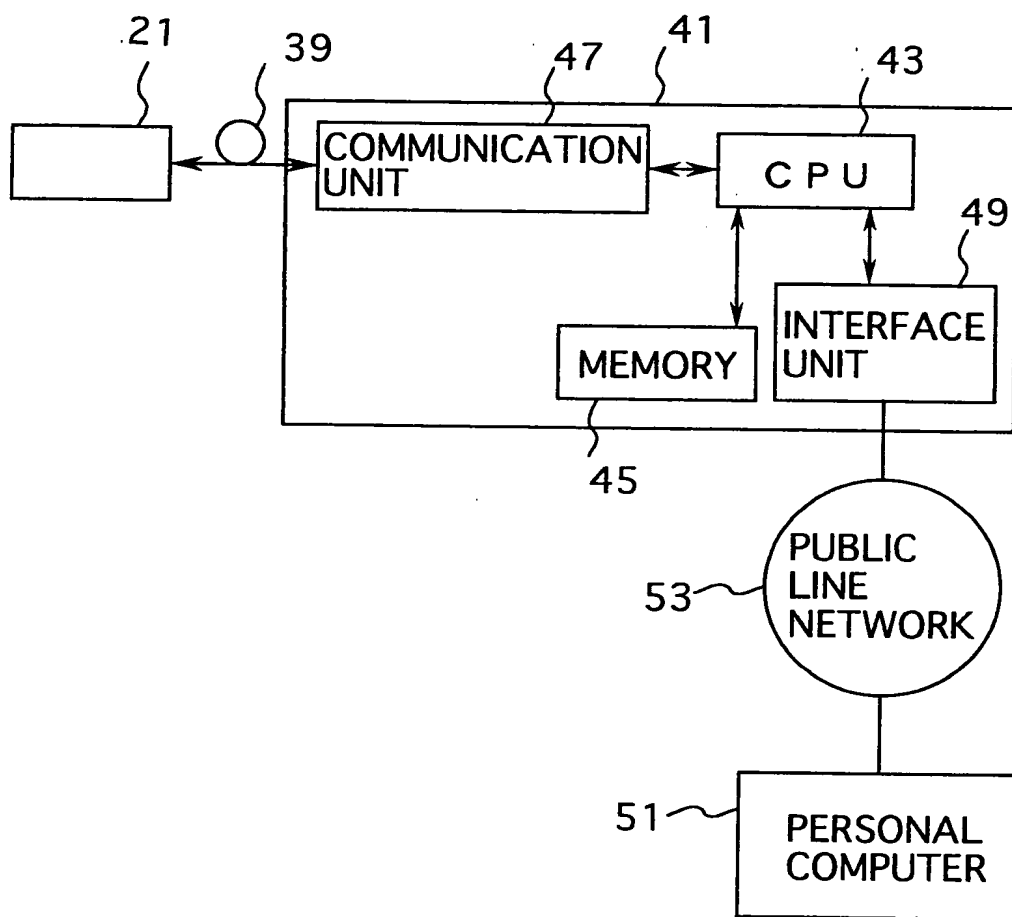
【FIG. 2】



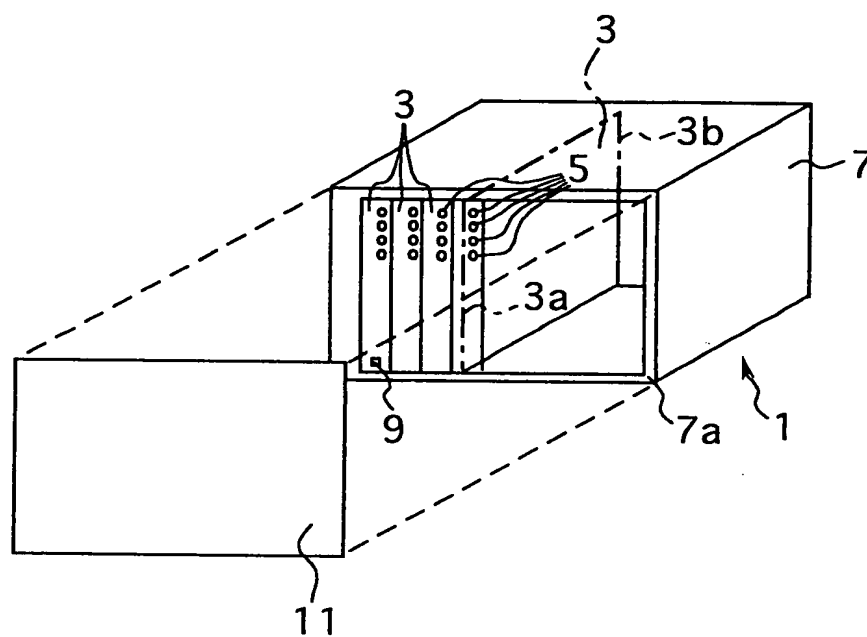
【FIG. 3】



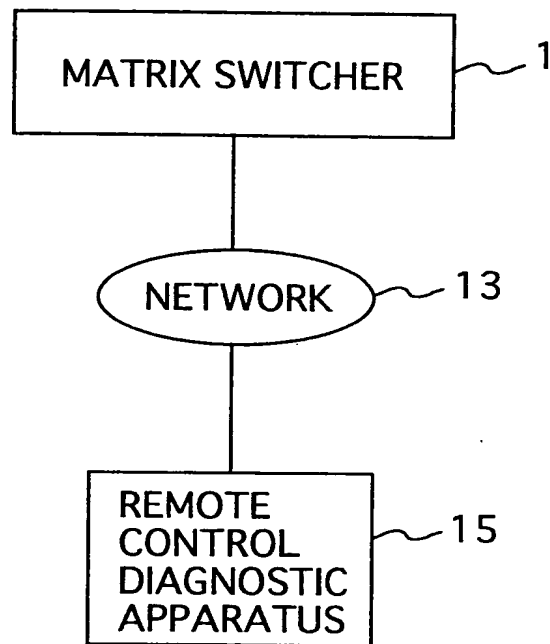
【FIG. 4】



【FIG. 5】



【FIG. 6】



[NAME OF DOCUMENT] ABSTRACT

[ABSTRACT]

[PROBLEM] To provide an equipment maintenance device capable of sensing an operating state of an equipment to be monitored without contact and operating an equipment in response to an operating state of the equipment, and to provide an equipment remote maintenance system capable of maintaining the equipment from a remote place having a remote diagnosis controller capable of communicating with the equipment maintenance device via a public channel network.

[MEANS FOR SOLVING]

The equipment maintenance device is provided, which comprises a light detector 25 for detecting a light of an LED display unit 5 of the equipment 3, a plunger 29 for pressing down a reset SW 9 of the equipment 3, a front cover 21 mounted on a front surface 3a of the equipment 3, a diagnosing unit 41 connected to a plurality of the covers 21, and a personal computer 51 for a remote maintenance connected to the diagnosing unit 41 through a public channel network 53. Thus, optical information of the unit 5 of the equipment 3 is transferred to the personal computer 51 through the diagnosing unit 41, the operating state of the equipment 3 is diagnosed, and the equipment 3 from the personal computer 51 of the remote place is reset and recovered, as needed.

[SELECTED DRAWING] FIG.1

This English translation of Japanese Patent Application No.2000-193202 has been prepared on July 10, 2003, by myself.

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A handwritten signature in cursive script, appearing to read "M. Nishimura", written over a horizontal line.

Mitsuru NISHIMURA

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